PERIODICUM BIOLOGORUM
VOL. 115, No 2, 191–195, 2013

UDC 57:61
CODEN PDBIAD
ISSN 0031-5362

Original scientific paper

Continous wound infusion versus epidural postoperative analgesia after liver resection in carcinoma patients

LJILJA ŠTEFANČIĆ[1]
GORDANA BROZOVIĆ[1]
DEANA ŠTURM[2]
BRANKA MALDINI[1]
KATA ŠAKIĆ ZDRAVČEVIĆ[3]

[1]Department of Anesthesiology, Resuscitation and Intensive Medicine Sestre milosrdnice University Hospital Center, Zagreb, Croatia

[2]Department of Transfusion Medicine, Sestre milosrdnice University Hospital Center, Zagreb, Croatia

[3] School of Medicine, University J. J. Strossmayer Osijek

Correspondence:
Gordana Brozović
Department of Anesthesiology, Resuscitation and Intensive Medicine Sestre milosrdnice University Hospital Center, Zagreb, Croatia
E-mail: gordana.brozovic@kbcsm.hr

Received May 20, 2013.

Abstract

Background: *Continuous wound infiltration (CWI) and epidural thoracic analgesia (ETA) are analgesic techniques commonly used in the multimodal management of postoperative pain after open abdominal surgery. The aim of this study was to evaluate the effectiveness in pain reduce and postoperative recovery of these techniques in patients scheduled for liver resection.*

Metods: *The retrospective study included 29 patients, with liver resection performed due to metastases of colon carcinoma. The patients were divided into two groups depending on type of postoperative analgesia. Wound catheter group (WC) included patients that had received analgesia through multiorifice wound catheter placed below the fascia and thoracic epidural group (TEA) included that had received local anesthetic through a epidural catheter. Both analgesic regimes were continued for 48 hours postoperatively. All patients received a standard postoperative pain management protocol, including patient-controlled analgesia (PCA) morphine and intravenous diclofenac every 12h. Outcomes measured over 48 h after operation were Numerical Rating Score (NRS) et rest and coughing, morphine consumption, and side-effects (PONV) and time to bowel function recovery.*

Results and Conclusion: *No significant difference in morphine consumption was observed between groups (p=0,395). Pain managment efficacy was satisfactory (NRS <4) in both groups and we did not find significant differences in Numerical rating skale (NRS) between groups (p=0,128). We did not observed statisticaly significant differece in incidence of postoperative nausea and vomiting (PONV).Time to recover the bowel function was significantly reduced in WC Group 85,93 ±21,02 h and in TEA Group 107,64 ± 20,02 h (p=.0,008). We conclude that wound catheter infusion in liver surgery is simple, safe and even more effective alternative to epidural analgesia in multimodal protocol for postoperative analgesia after liver resection.*

INTRODUCTION

Liver resections is associated with intense pain in the early postoperative period.

The pain has a major influence on patents satisfaction *(1)* and may negatively interfere with the postoperative recovery *(2, 3)*.

The ideal postoperative analgesic regimen should provide good analgesia, be minimally invasive, have a low incidence of side effects and minimal impact on staff workload. Clinical studies also suggest

that intesity of postoperative pain is significant predictor of chronic postoperative pain.

Multimodal regimens (simultaneous use of >2 techniques with unique mechanismus of action or locations) to postoperative pain relief has been studied in general, thoracic, orthopedic obstetric and gynecologic surgery resulting in additive or synergistic analgesia with lowered adverse effects of sole administration of individual analgesics and techniques *(4)*.

Combination continuous TEA or CWI analgesia with nonsteroidal antiinflammatory drugs (NSAID) and opioid (morphine) patients control analgesia are multimodal analgesic techniques that provide good postoperative analgesia and minimalisation side effects of therapy.

Continuous EA is a technique that ensures quality analgesia for surgery in the upper abdomen. The advantages of EA are reduced opioid consumption, lower incidence of cardio and pulmonary complications, shorter duration of postoperative ileus and early mobilization of patients *(5)*. However, there are some limitations in the use of TEA in liver surgery such as postoperative coagulation disorders. TEA is also invasive, labor intensive and expensive technique of analgesia. Failure rates in epidural catheter placement are not insignificant and a failure rate of 32% has been reported in database of 25000 patients *(6)*.

Continuous wound infiltration (CWI) is analgesic technique of administering local anesthetic directly into the surgical incision through multi-holed wound catheter placed by surgeon on the end of the procedure. This technique is easy to perform, provide successful analgesia and good tolerance. A systematic review of randomized controlled studies confirmed the benefits and safety or technique, showing a reduction in the incidence of opioid consumption and opioid related side effects, earlier recovery of bowel function and hospital stay *(7)*. Similarly,wound infusion with a catheter placed subfascially provided postoperative analgesia that was as effective after cesarean delivery as an epidural technique *(8)*.

The aim of this study to compare effectiveness both multimodal analgesic regimens in pain reduction, morphine consumption and recovery of gastrointestinal function in patients following liver resections.

METHODS

After obtaining institutional review board approval, we conducted a retrospective study including patients of both gender, American Society of Anesthesiologist Physical Status I–II (ASA), that underwent elective liver resection due to metastases of colorectal carcinoma during the period from 2012 to 2013 at the University Hospital Center *Sestre milosrdnice* – Clinic for Tumors.

Only patients who had wound or epidural catheter for postoperative analgesia after liver resection for 48 hours postoperatively were included in study. Exclusions were: patients with ASA III physical status, obesity (body mass index > 30kg/m2), inflammatory bowel diseases, preoperative cognitive dysfunction, chronic pain, preoperative opioid consumption, psychiatric disorders, inability to use the patient –controlled analgesic device, who had PCA opioid intravenous analgesia postoperatively, or patients with stoma or undergoing on concomitant bowel resection and patients who died in postoperative course. Data for each patient were abstracted from inpatient medical records.

Patients included in the study were divided into two groups depending on postoperative analgesic regimen: Wound catheter group (WC) included patients that had received analgesia through multiorifice wound catheter placed above the fascia. Thoracic epidural group (TEA) included patients that had received local anesthetic through a epidural catheter. Both analgesic regimes were continued for 48 hours postoperatively. All patients received a standard postoperative pain management protocol, including patient-controlled analgesic (PCA) morphine and intravenous diclofenac every 12h.

All patients received premedication midazolam 0.1 mg/kg orally 1 h prior to the induction into anesthesia. They were monitored with electrocardiogram, pulse oxmetry, capnography, inspired and expired oxygen, anesthetic vapor concentration, systemic (radial) arterial blood pressure, and central venous pressure through the right jugular vein and bispectral index analysis (BIS).

An epidural catheter was preoperatively inserted into epidural space of all patients at the T8–T11 level using the loss of resistance technique after local anesthesia. Lidocaine 2% 2 ml, plus 2 ml after 5 min was used to exclude the subarachnoid placement of the catheter. Levobupivacaine 0.5% 5–7 mL and 100 mcg fentanyl were injected before the induction of anesthesia, and following that a combination of 0.25% bupivacaine and fentanyl was continuously administered (2mcg/ml) in the dosage of 4–6 mL/h.

All the patients were operated on under general anesthesia. According to the usual practice in our institution anesthesia was introduced by Propofol 1–2 mg/kg, fentanyl 2–3 μg/kg and vecuronium 0.1 mg/kg. After endotracheal intubation, anesthesia was maintained by sevofluran 1.5–2.0% in 50% oxygen-air mixture, and repeated by relaxant vecuronium 0.5 mg/kg, and fentanyl 100 μg 1.v.

After operation PCA device was connected in ICU to both group of patients to an intravenous infusion set (Curlin Medical 6000 CMS, USA) to deliver a 2 mg dose morphine with a 10 minute.lock-out time for 48 postoperative hours.

In Group WC multiholed wound catheter 30 cm long was inserted by the surgeon along the full length of the wound 3 cm from subcostal start of incision above the fascia and connected to the electric infusion device (Braun, Germany) to deliver 8 mL 0.25% levobupivacaine for 48 hours. Immediately after wound was closed 10 mL 0.25% levobupivacaine bolus was given. All patients received diclofenac 75 mg IV and morfine 0.1 mg/kg IV, 30 minutes before the conclusion of the surgical procedures.

In EA group of patients at the end of operation mixture of 0,125% levobupivacaine and fentanyl 2 mcg/ml was administered through epidural catheter continuously for 48 hours. Rate of administration was 6 ml/h.

Pain intensity was measured in both group using Numerical Rating Scale (NRS 0 –10) during rest and mobilization on day of operation (POD 0), first (POD1) and second (POD2) after surgery.

Morphine consumption for 48 hours was noticed et the same way in both groups. Nasogastric tube was left in place for 24 h after surgery. Oral fluids and enteral nutrition were administered 12 h after surgery and solid meals were given the day after.All side effects were recorded.

Limitations of this study included a small sample size, location within a tertiary – care facility, and retrospective nature of study designe.

RESULTS

During the study period 29 patients met inclusion criteria for this study were identified.

Fourteen patients in Group EA and fifteen patients in Group WC were included in the main analysis. Study groups were comparable and did not differ in demographic data.

The primary outcome of this study, pain managment efficacy was satisfactory (NRS <4) in both groups (Figure 1 and 2).

Secondary outcomes, postoperative morphine consumption, was found to be low in both group and there was no statisticaly significant differences between them. Morphine consumption during 48 h in WC Group was 17,88±5,4 mg and in TEA Group 14,47±4,6 mg.

Time to recover the bowel function was significanty reduced in WC group 85,93 ±21,02 h (Figure 3) and in TEA Group 107,64 ± 20,02 h (Figure 4).

During the whole posotperative period there was no stastisticaly significent differences between Groups WC (18%) and TEA(20,9%) in postopeative nausea and womiting.

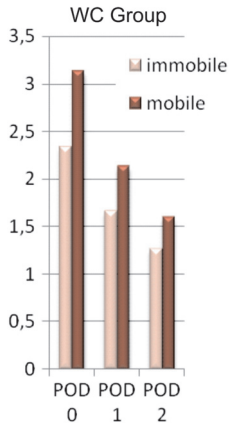

Figure 1. *Postoperative pain intesity during postoperative day (POD 0, POD1; POD2) et rest and coughing in WC Group.Statistical significant diference in pain intesitiy in rest and cough Mann Whitney p = 0,031). Morphine consumption in 48 h =17,88±5,4 mg*

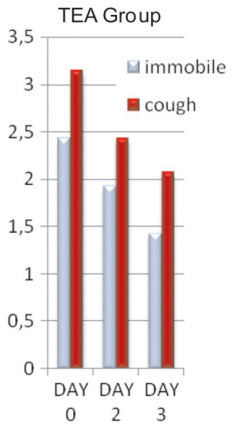

Figure 2. *Pain intesity during podoperative day 0,1,2 in TEA Group. Statisticaly significant diference in pain intesity et pain et rest Mann Whitney p = 0,002*

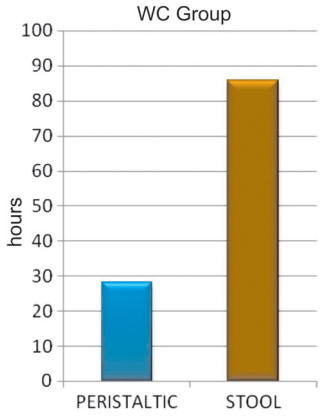

Figure 3. *Time to bowel movement (periistaltic) 28,2 ±8,88 hours and first defecation 85,93 ±21,02 h*

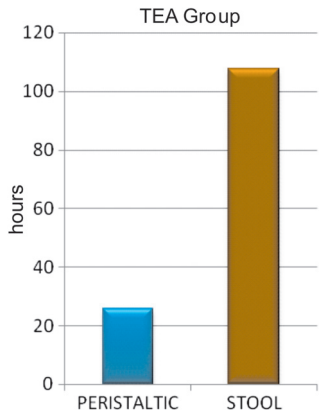

Figure 4. *Time to first bowel movement 25,93 ± 13,85 hours and first defecation 107,64 ± 20,02 h*

Time of recover the bowel function was significantly reduced in WC Gruop (p =0,008) Figure 5.

PARAMETER	STATISTIC SIGNIFICANT p < 0,05
NRS	0,128
MoHCl	0,395
Peristaltic	0,127
Stool	0,008
PONV	0,580

Figure 5. Statistical differences bettween Goup TEA and WC. *First stool – defecation after operation in WC Group was after 85,93 ± 21,02 hours and in TEA Group107,64 ± 20,02 hours with signifficant statistical difference. There is significant statistical difference (t- test: p < 0,008).*

DISCUSSION

Pain control after hepatic resection presents unique challenges as subcostal incisions, rib retraction, and diaphragmatic irritation can lead to significant pain.

Multimodal analgesia with combined local anesthetic wound infiltration or epidural block,systemic opioids and NSAIDs provided satisfactory analgesic effect for most major surgical procedures.

The literature supports the use of local anesthetics as a component in these protocols for two important reasons: they reversibly block action potential propagation in axons and also have a antiinflamatory effects. The authors emphsized the important role of systemic use of nonsteroidal antiinflammatory drugs in postoperative analgesia *(9)*. Local anesthetic and NSAID as component of multimodal anagesia resulted in less need for systemic morphine consumption, lower pain scores and reduction in opioid related side effects and faster recovery of bowel function.

Postoperative analgesia with median NRS <4 et rest and coughing was satisfactory in both group of patients.

Opioid consumption was low in both Group of patients and minimaze adverse effects related to their use like PONV. We did not find any significant difference in morphine consumption during 48 h between two groups.

We found earlier recovery of bowel function in WC Group. Revie EJ, *et al*. has been published about the management of epidural-related hypotension with excessive fluid administration and attempts to mobilize patients with epidurals in the early postoperative period can be limited by postural hypotension *(10)*. Excessive fluid replacement may be a reason of prolonged bowel recovery in TEA Group. Fentanyl use as part of analgesic mixture in TEA Group may also impact on prolonged gastrointestinal paralysis.

Currently, there no comparative studies that show that epidural analgesia is superior to an local anesthetic intravenous or wound infusion or to gum chewing in decreasing the risk of ileus.

A higer doses of local anesthetics delivered through wound catheter and local anesthetic antiinflamatory action are may be additional part in postoperative pain control and faster recovery of gastrointestinal function.

The size of liver resection has been correlated to the impairment of local anesthetic metabolism, larger volume resections result in greater impairment of drugs metabolism.

In our study we did not find no signs of local anesthetic toxicity or side effect et any of patients.

Epidural catheter placement include is associeted with risk of epidural hematoma, epidural abscess, and spinal cord injury. These risks are increased post hepatectomy due to alterations in coagulation profile *(11)*. Postoperative coagulopathy is at its peak 2–5 days post surgery. Epidural catheter removal was delayed for 1–3 days as a result of coagulopathy in 2/14 (13,3%) patients. No patients developed an epidural haematoma or abscess. Limitations of this study included a small sample size, location within a tertiary – care facility, and retrospective nature of study design.

CONCLUSIONS

In our study we demonstrated that multimodal analgesia with continous wound infusion of local anesthetic, thorough the infusion catheter is an good alternative to epidural analgesia for postoperative pain control after elective liver resection. The analgesic efficacy of wound infiltration and epidural catheter analgesia is equal, occurence of unwanted side effects without significant differences in both procedures and time to gastrointestinal recovery is faster in WC Group.

Coagulation disorders after liver resection and low molecular heparin therapy has no influence on placement or extration of wound catheter.

No signs of local anesthetic toxicity or side effect were reported by any of patients.

There is increasing evidence that wound catheter infusion is simple, safe and even more effective alternative to epidural analgesia.

REFERENCES

1. MYLES P S, WILLIAMS D L, HENDRATA *et al.* 2000 Patient satisfaction after anaesthesia and surgery: results of a prospective survey of 10 811 patients. 84: 6–10
2. WHITE P F, KEHLET H, NEAL J M et al. 2007 The role of the anesthesiologist in fast-track surgery: from multimodal analgesia to perioperative medical care. *Anesth Analg 104:* 1380–96
3. BONNET F, MARRET E 2005 Influence of anaesthetic and analgesic techniques on outcome after surgery. *Br J Anaesth 95:* 52–8
4. KEHLET H, WILMORE D W 2002 Multimodal strategies to improve surgical outcome. *Am J Surg183:* 630–641
5. PARK W Y, THOMPSON J S, LEE K K 2001 Effect of epidural anaesthesia and analgesia on perioperative outcome. A randomized, controlled Veterans Affairs Cooperative Study. *Ann Surg 234:* 560–571
6. READY L B 1999 Acute pain : lessons learned from 25,000 patients. *Reg Anesth Pain Med 24:* 499–505
7. LIU S S, RICHMAN JMTHIRLBY R C, WU C L 2006 Efficacy of continous wound catheters delivering local anesthetic for postope-

rative analgesia a quantitative and qualitative systemic review of randomized controlled trials. *J Am Coll Surg 203:* 914–932

8. RANTA P O, ALA-KOKKO T I, KUKKONEN J E *et al*. 2006 Incisional and epidural analgesia after cesarean delivery: a prospective placebo-controlled randomized clinical study. *Int J Obstet Anest 15:* 189–194
9. CASSUTO J, SINCLAIR R, BONDEROVIC M 2006 Antiinflamatory properities of local aneshetics and their present and potential clinical implications. *Acta Anesthesiologica Scand 50:* 265–82
10. REVIE E J, MASSIE L, MCNALLY S, MCKEOWEN D *at al*. 2011 Effectiveness of epidural analgesia following open liver resection. *HPB (Oxford) 13(3):* 206–2011
11. SHONTZ R, KARUPARTHY V, TEMPLE R, BRENNAN T J 2009 Prevalence and risk factors predisposing to coagulopathy in patients receiving epidural analgesia for hepatic surgery. *Reg Anesth Pain Med 34:* 308–11

.